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**CHANGE OF EDUCATIONAL SPACE UNDER INFLUENCE OF
INFORMATION AND COMMUNICATION TECHNOLOGIES**

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Abstract

Information and communication technologies form a fundamentally new information and educational environment, largely determine the qualitative changes in the cultural and educational space. The availability of the Internet and the development of WWW determined not only the possibility of communication of people regardless of their geographical location, but also the ways of collective space-and time-distributed activities. Forms of distance learning, cloud-based technologies and services provide relationship many-to-many, collaborative network activities, while the technologies of distance and e-learning education serve as new tools and methods of educational activity organization of subjects of education at the same time. The formation of the global educational space is becoming large-scale irreversible, which in turn requires improving the mechanisms of knowledge exchange, the formation of IEE and open educational resources as components of the educational space in the information and digital age. In this aspect, the article deals with the cause-effect relationship between the changes in informational and communicational technologies and the changes in the educational space, its shape, its interaction with the society, and in what way it may influence the objects and subjects in the educational space. It is concluded that the development of modern informational and communicational technologies led not only to a qualitative change in the educational space, but also to the change in the notion of this space, as well as in the logic of this spatial representation and interaction with it.

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1. Introduction

Modern understanding of education is that it is an educational process and its results, where the process includes teaching and personal development, education and upbringing.

The sphere of education, generated by the educational process, has invariant, logical relations, thus, is an open, integral and evolvable system.

A holistic, system-integrated subject of education as a cognitive system includes: content, methodology, its approaches, principles, methods and processes that realize them.

A holistic subject of education is differentiated according to the selected features and receives a representation (mapping) in the structure of educational subjects, instruction subjects and their teaching methods. That is, a holistic, system-integrated subject of education has its manifestation in the system of methods of educational subjects of study, in the system of systems, or the metasytem.

The implementation of the systemic principle in education means the consideration of the sphere of education, its methodology and invariant structural components as systems, which are open, holistic, self-developing, social and informational.

2. Problem Statement

The emergence of the Internet, telecommunication technologies, e-mail, and then the development of Web determined not only the communication possibilities of people regardless of their geographical location, but also ways to of implementing collective activities distributed in space and time, including the development of a the system of corporate or mixed training based on educational websites and portals.

Distance learning technologies and cloud computing provide “many-to-many” relationships, collaborative networking activities, and distance and electronic learning are emerging as new tools and methods for e-learning (Daniel, 2012; Armoni & Gal-Ezer, 2014; Cress & Kloos, 2014; Baron, Drot-Delange, Grandbastien & Tort, 2014; Brown, Sentance, Crick & Humphreys, 2014; Choi, An & Lee, 2015). At the present postindustrial times this process acquires a large-scale irreversible character and new approaches are required to the formation of an educational space in the information digital era and to defining ways of solving current educational issues (Gal-Ezer & Stephenson, 2014; Lapchik, 2014; Henner, 2014; Abdurazakov, Korotnikov & Muhidinov, 2016; Andreev, 2011; Lapchik, 2017).

There emerges a need for revision and reorganization of the educational system towards the globalization of the educational process, wherein teaching should be organized with internet network services, network integration of educational institutions for the preparation of specialists who are demanded on the labour market (Informatics education..., 2013; Knox, 2014; Hubwieser, Armoni, & Giannakos, 2015; World Open Educational Resources (OER) Congress, 2012). These factors result in a contradiction - between the high emergence rate of innovative teaching aids and the lag in the development of methods for their implementation into education, when computer technologies are rapidly evolving, and the pace of their conceptualization and implementation of educational potential by teachers, methodologists and IT specialists lags behind theoretical developments.

3. Research Questions

Internal and external factors of general education mutually influence on each other and on general education as a social and informational system that is developing and being developed and these factors become questions of our research.

Internal factors of the educational sphere constitute its internal potential, which itself is its internal factor:

- its potential as an open, holistic system,
- the potential of its structural components,
- the potential of their systemic relationship.

This is also the internal potential of the scientific and methodological education system, subject methods, also transformed into scientific and methodological systems, the potential of their inter-scientific and inter-subject connection.

External factors, environmental factors include:

1. Informational factors of mutual influence, formed due to globalization and global informatization of society in its cognitive, pragmatic, technological, social and cultural, legal, worldview and other aspects.

2. Social and economic factors that were formed due to a qualitative change in society, its information sphere and was marked by the transition of society to a new evolving state - the informational society.

3. Legal factors - the development of law, legislation in the social and informational sphere. Informational law is a necessary tool for governing relations, being, at the same time, the subject of knowledge.

These external factors, entering into education, subject training, creating in its sphere images and projections, become internal or generate internal factors and require appropriate reflection in the scientific and methodological education system and in the subject of scientific and methodological systems.

4. Purpose of the Study

The aim of the study is to identify the causal links between changes in information and communication technologies and changes in the educational space in the era of information and digital technologies; to study the content and form of this interaction, its consequences and results manifested in new educational forms and structures, in particular, in the educational virtual world and educational cyberspace.

5. Research Methods

The methods of formalization, systematization, modelling, logical representation were used.

6. Findings

One of the most essential factors that significantly influences the educational process and its results is the informatization of society, which receives a projection far from trivial in the life and activity of each social system and every subject, including the educational system and every subject of education.

Informatization of society has become a global phenomenon, changing the way of life, culture and worldview of people, science and industry, reflected in the nature of relations, communication and interaction, in social norms and law. Global information exchange and interaction in an integral informational environment, formed under the influence of information, create a favourable environment for the development of integration processes. Inter-system interaction is complemented by the interaction of national information systems.

In considering education in a systemic aspect, implementing a fundamental systemic approach, it is necessary to present it as a holistic multifunctional integrated system that unites the processes of education and its informatization processes.

The educational and training process is reflected in the continuous informational and educational interaction of various subjects and objects of teaching: students, teachers, pupils, educators, educational information, teaching aids, etc. Planning, streamlining, optimization of this process can be implemented only through its discrete and, therefore, formalized presentation in the form of a system of relations.

Educational and training interaction is becoming a constituent element of education, educational processes and subject to subject and subject to object relations are being integrated. That is, in modern education these concepts converge:

the educational process is realized through educational interaction, developing its content and forms of implementation;

educational interaction is expressed through the implementation of the educational process.

As an open developing social system with invariant connections of its constituent parts, education has its own regularities, systemic regularities. They are logical and, therefore, invariant relations of the educational system considered as an informational structure with some abstraction from its social content, semantics and pragmatics. Identifying systemic regularities of education is necessary for its full development, as well as for comprehension and evolving the educational environment, determining and realizing their systemic and intersystem connections.

It is necessary to represent education as an integral system with common goals, requirements, principles of their implementation, universal methods of educational and training activities. Educational subjects must be focused on developing universal knowledge, abilities, educational actions having general educational value and wide area of application. General goals, priorities, principles of education must be expressed.

When this requirement is met, the universal knowledge and skills obtained during subject training, represented in a variety of educational subjects, will become homogeneous in terms of the significance level in the cognition sphere. In addition, they can become the basis for creating an integrative relationship between this knowledge and skills, and at the same time between the educational subjects themselves.

Thus, modern education has following issues:

The issue of compatibility of spiritual things with intellectual, humanitarian with natural scientific.

The issue of compatibility of reproductive training with developmental.

The issue of the composition and amount of the content of educational subjects in terms of effectiveness and safety of training.

The issue of systemic (metasystem) interrelationship of educational subjects.

The issue of the consistency of fundamentality and universality in learning, subjectivity and meta-subjectivity.

The sphere of education, which naturally includes pedagogy, subject methodology, management, creating favourable environment for an effective implementation of the educational process, develops requirements for the conditions of education, its goals, methods, forms, other internal factors that positively influence the education processes and results.

The contemporary educational process is carried out through interaction of information with education, through subject-object and subject-subject relations:

subject - resource, teacher - student, student - student.

The educational environment in this interaction is not only a medium, but also an active participant in their implementation.

The concept "educational environment", as well as the concept "informational and educational environment", is defined by approaches for interpretation of education, ideas about the goals and objectives of the educational process.

V. M. Polonsky considers the environment to be crucial, but not the only factor of individual development; "... the general characteristic of the term environment defines it as a substance that, unlike an empty, unfilled space (vacuum), possesses certain properties that affect the transition of interaction between these objects" (Polonsky, 2004, p. 119).

The contemporary dictionary of Pedagogy, gives the term "environment" the most general sense "a set of conditions surrounding a person and interacting with him as an organism and a person" (Andreeva 2005, p. 68).

Since educational interaction and educational relationships are realized in the educational sphere, their environment, as an active participant and medium, is also its indirect, associative component. That is, the educational environment is manifests itself as an internal, projecting onto the sphere of educational interaction.

The objects and resources of the social environment external to education, as the means of educational application, that is, used for educational purposes, remain physically external to it. However, interaction with them, the corresponding subject-object relations, being informational and educational, are elements of educational field.

The educational field creates the conditions for its own functioning and development. Furthermore, it composes these conditions and favorable factors itself: relations, interrelationship, interaction. This is its internal potential as a pedagogical system.

Informatization of the educational space and its essential characteristics

The informational influence of IEE (Informational and Educational Environment) on the process of education, subject training is the indirect impact of the informatization of education on them. IEE is a multidimensional base of scientific and cognitive and social and cultural knowledge, adapted for education. That is, interaction (informational impact with forward and backward linkages) in the paradigm education-IEE expands to interaction in the next paradigm, (Korotenko, 2011): Education - informatization of education - IEE.

The efficiency, rationality and security requirements for all active participants in educational interaction, its subjects and objects, suggest the need for its organization, streamlining, formalization, and modeling. Modeling means the identification of an optimal set of informative, conceptual characteristics having sets of meanings, different but semantically homogeneous for each of these sets. That is, a spatial representation of the educational field, a transformation into an educational field are required. Since modern education is informational, this space is also informational, that is information and educational.

A wide range of issues related to the formation and change of the educational space and the educational environment through the development of information and communication technologies (ICT) have been discussed in the works of the authors (M. I. Bashmakov, A. I. Bochkarev, N. V. Gruzdeva, S. V. Ivanova, A. A. Kuznetsov, Yu. G. Korotnikov, A. M. Novikov, S. I. Chernykh, V. A. Yasvin, et. al). Particular attention has been paid to the influence of ICT on the formation of educational space, a fundamentally new information and educational environment as an integral part of this space in the era of digital technologies.

For example, A.M. Novikov considers the educational space as "the aggregate of all subjects and objects directly or indirectly participating in the processes of education, either interested in or influencing them" Новиков (Novikov, 2013; Ivanova, 2013, 2016) the stated issues are considered in two aspects: space as "the objective world, the totality of various objects that create and fill this space" and "space as an object of subject activity, consisting in perception, action, which are connected with it in one way or another" (0, 2013, p. 73).

Informatization efficiency of the educational space devolves from the definition of technical and technological parameters into its essential characteristics. S. V. Ivanova points out that there is a need to determine the appropriate qualitative parameters of the informational and educational environment, which allow you to assess the results of its impact on the subjects of the educational process, the quality of education. At the same time, the IEE "is a product of the purposeful efforts of the subjects, carrying out their activities, under the influence of various factors" (Ivanova, 2016, p. 95).

The holistic informational space of education is an open developing system in which all active participants, subjects and objects of educational and instructional process are involved and interlinked at the level of information and communication.

Educational space typology

Spatial representation suggests the choice of a relational logical model, that is, determining the conceptual features of space as its dimensions with the corresponding metric, and their values as metric indicators. But it is difficult to implement in an educational field with a variable structure, and can only be conditional, credible in abstract, theoretical studies, but unimplementable at local levels of the educational field. Thus, it is more acceptable for it to be a balanced combination of relational and hierarchical logical models:

At the level of the complete informational space, which corresponds to the entire educational sphere, there exists a certain set of measurement characteristics, which have an abstract spatial representation corresponding to the subspace of the complete educational space.

An abstract spatial representation corresponding to the subspace of a given local educational space can also be identified on each educational space of the local level, and this can recur hierarchically.

That is, the educational field has a representation in the form of a relational structure, represented in a certain, variable set of local relational and hierarchical structures, and this process of the local relational hierarchical representation is consistent and has a hierarchical representation itself.

Evidently, at any moment of the educational field development, in any of its concrete states, such sequence of relational hierarchical representations of the educational field is finite, since it always has a finite number of connections and relations.

There are two main types of educational space - real and electronic.

The real educational space is a structured representation of subjects and objects of the education field, all its functional, pedagogical, organizational, administrative structures and institutions, their interconnections and relationships that really exists in the social environment. This is a relatively invariant structure, although it is being developed, due to the constant and continuous development of the original prototype - the educational sphere.

By way of example the type, level, form of education and, with some conventionality, the "educational subject" attribute can be determined as global conceptual or measurement characteristics, since basic educational ones are present in all types, levels and forms of education. These characteristics can themselves operate as an abstract relational and hierarchical space corresponding to some subspace of the real educational space.

The real educational space evolves, both as a result of changing social conditions, and owing to the scientific and technological revolution. Such a revolution was informatization, the rapid growth of information and communication technologies, which resulted in IT industry and the state of the information society. In the educational sphere its reflection has become a new functional and pedagogical structure, the "informatization of education", the educational subject "Computer Science" with the section "Social computer science". Informational and media education permeates all modern education and, in fact, have become its form.

Information and communication technologies have become both the means and the subject of each system of learning, primarily of computer science. However, computer science is primarily a theory, and information and communication technologies are represented in the teaching practice. Modern education trends that meet the requirements of the information society suggest an increase in the importance of information education, which should entail a separation of the teaching computer science and information and communication technologies, in conjunction of their own theory and practice. It is necessary to introduce two independent subjects of information education.

Another level of modern educational space is electronic. It is the brainchild of the 21st century, the product of the informatization of society and education. This is a specific part of the electronic world of society, developing with it and being under its influence.

The electronic world is generated by information and communication technologies, by means of automated processing, storage, transmission and displaying information, means and objects of the media environment. In regard to men, this world is surreal, virtual, neither imaginary nor tangible, completely abstract, living according to its own laws. At the same time, the virtual world has been created by men, society, thus it is social, also a social and cultural sphere and has a social and social and cultural purpose.

The electronic educational space is also virtual and, therefore, has its own specific features, different from the real educational space. Since this space has a definite pragmatics, the peculiarity of its relational hierarchical representation and its representation should contribute to the realization of this pragmatics.

Due to pragmatism electronic and communication virtual educational space is organized, systematized, transformed into a multidimensional relational and hierarchical space, cyberspace with a network implementation of the relationship. This space is intellectual, and its intelligence is based on the original natural intelligence of man and the artificial intelligence of formal systems. Obviously, it should also have continuity in social culture, information culture.

Educational cyberspace is a product and means of information society, informatization, informatization of education that provides effective and rational educational interaction in the virtual world, in the media environment. This is an abstract representation of the electronic virtual world, the media environment with a variable, but always streamlined set of spatial attributes and dimensions, which allows modelling and algorithmizing the path in any possible direction.

The relational nature of educational cyberspace is conditional as a necessary means of ensuring the orientation of the subject of interaction in it. In fact, this is an integrated representation of the diversity of media relational and hierarchical educational cyberspace.

Each active system, every subject of education, developing their personal environment, can create their own individual virtual world as a local part of educational cyberspace with their many metrics and "dimensions". Therefore, in the virtual educational cyberspace, its metrics and "dimensions" also become virtual.

The Chinese scientist Liu Gang and many other researchers connect cyberspace with modal logic, since the choice of any path and structure of any subspace in it is based on multiple logical assessments, necessity and chance, possibility and impossibility. In this case, Liu Gang points out the following: "cyberspace, formed by a computer network, is nothing more than ... a tool for exploring our feelings and minds," (Liu Gang, 2007). It is the use of modal logic and its possibilities for modal assessments of relations in cyberspace that he relates the development of "our sense and reason to".

Hence, effective interaction with educational cyberspace suggests the expansion of binary logic due to modal logic and consideration of the relational and hierarchical structure of the educational space in the aspect of this logic modalities. In this regard, much has been recently said about the need for the "cybersocialization" of the individual and the formation of his "cyberculture" (Pleshakov, 2011). The consideration of this issue through the prism of modal logic and, accordingly, the modal and logical representation of educational cyberspace will help to better understand its nature and, consequently, find its effective solution (Abdurazakov et. al, 2016, p. 442).

7. Conclusion

Educational cyberspace along with the whole cyberspace "has been acquiring transnational character, creating a free zone in world culture and civilization, independent of borderline cordons, economic duties, political bans and censorship. The power of information flows stimulates the development of cultural contacts, opens the possibility for a real dialogue with the mass audience and

simultaneously creates a situation of extremely individual communication", (Ikonnikova, 2008). This is obviously not only the provision of qualitatively new opportunities, but also the presentation of multiple requirements and, consequently, problems and tasks.

Thus, the development of modern information and communication technologies entailed not only a qualitative change in the educational space, but also a change in the notion of this space, as well as the logic of this spatial representation and interaction with it.

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